Water Quality Assessment
Lightner Creek
Lightner Creek Campground LLC WWTF

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I. Water Quality Assessment Summary

Table A-1 includes summary information related to this water quality assessment (WQA). This summary table includes key regulatory starting points used in development of the WQA such as: receiving stream information; threatened and endangered species; 303(d) and Monitoring and Evaluation listings; low flow and facility flow summaries; and a list of parameters evaluated.

Table A-1
WQA Summary

Facility Information

Facility Name	Permit Number	Design Flow (max 30-day ave, MGD)	Design Flow (max 30-day ave, CFS)
F1. Lightner Ck Campground WWTF	CO0026468	0.01	0.016
F2. Lightner Ck MHP WWTF	PEL200150 (COX-0029904)	0.01	0.016

Receiving Stream Information

Receiving Stream Name	Segment ID	Designation	Classification(s)
S1. Lightner Creek	COSJAF14b	Undesignated	Aquatic Life Cold 1, Recreation Class E, Agriculture, Water Supply

Low Flows (cfs)

Receiving Stream Name	1E3 (1-day)	7E3 (7-day)	30E3 (30-day)	Ratio of 30E3 to the Design Flow (cfs)
S1. Lightner Creek	0.47	0.47	0.64	F1: 43 F2: 48

Regulatory Information

T&E Species	303(d) (Reg 93)	Monitor and Eval (Reg 93)	Existing TMDL	Temporary Modification(s)	Control Regulation
No	None	None	No	None	Regulation No.39, Salinity

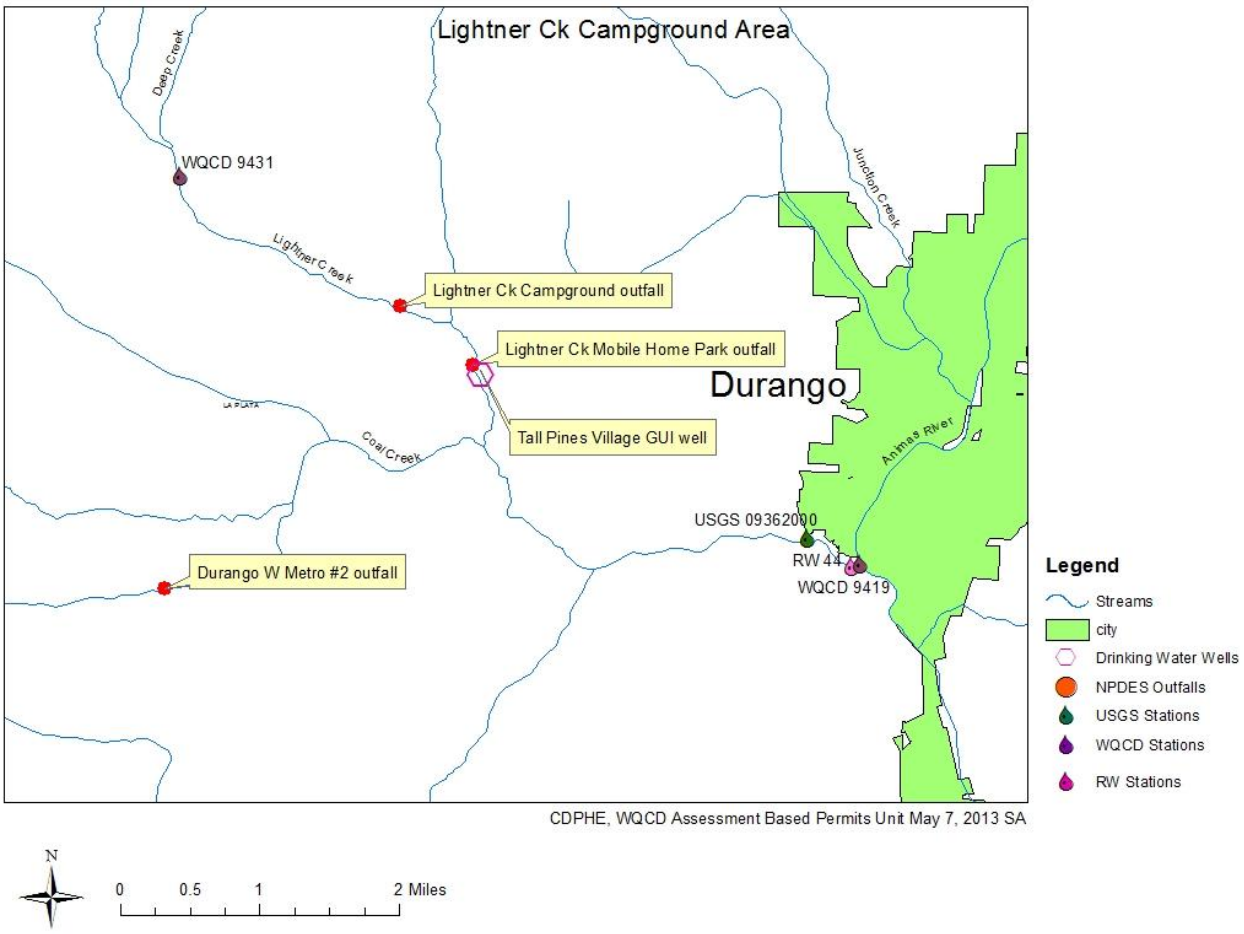
Pollutants Evaluated

F1: Ammonia, *E. Coli*, TRC, Nitrate
F2: Ammonia, *E. Coli*, TRC, Nitrate

II. Introduction

The WQA of Lightner Creek near the Lightner Creek Campground and Lightner Creek Mobile Home Park Wastewater Treatment Facilities (WWTFs), located in La Plata County, is intended to determine the assimilative capacities available for pollutants found to be of concern. This WQA describes how the water quality based effluent limits (WQBELs) are developed. These parameters may or may not appear in the permit with limitations or monitoring requirements, subject to other determinations such as reasonable potential analysis, evaluation of federal effluent limitation guidelines, implementation of state-based technology based limits, mixing zone analyses, 303(d) listings, threatened and endangered species listing, or other requirements as discussed in the permit rationale. Figure A-1 contains a map of the study area evaluated as part of this WQA.

FIGURE A-1



The Lightner Creek Campground and Lightner Creek Mobile Home Park WWTFs discharge to Lightner Creek, which is stream segment COSJAF14b. This means the San Juan River Basin, Animas and Florida Sub-basin, Stream Segment 14b. This segment is composed of the "Mainstem of Lightner Creek from below the confluence with Deep Creek to the confluence with the Animas

River." Stream segment COSJAF14b is classified for Aquatic Life Cold 1, Recreation Class E, Water Supply and Agriculture.
The Lightner Creek Campground is located approximately 0.8 miles upstream of the Lightner Creek Mobile Home Park (MHP). Due to the proximity of the two facilities, they will be modeled together in this WQA analysis. It should be noted that the Lightner Creek MHP discharges under permit (COX-0029904) as a discharge to groundwater; however, the facility has been determined to need a surface water discharge permit and a Preliminary Effluent Limit (PEL) analysis has been completed (PEL200150). The PEL was developed using a design capacity for the MHP of 0.01 Million Gallons per Day (MGD). That design capacity is therefore being used in this WQA analysis when the facilities are modeled together.

Information used in this assessment includes data gathered from the Lightner Creek Campground WWTF, the Water Quality Control Division (Division), the Colorado Division of Water Resources (DWR), Riverwatch, the U.S. Environmental Protection Agency (EPA), the U.S. Geological Survey (USGS), and local water commissioner. The data used in the assessment consist of the best information available at the time of preparation of this WQA analysis.

III. Water Quality Standards

Narrative Standards

Narrative Statewide Basic Standards have been developed in Section 31.11(1) of the regulations, and apply to any pollutant of concern, even where there is no numeric standard for that pollutant. Waters of the state shall be free from substances attributable to human-caused point source or nonpoint source discharges in amounts, concentrations or combinations which:

for all surface waters except wetlands;

(i) can settle to form bottom deposits detrimental to the beneficial uses. Depositions are stream bottom buildup of materials which include but are not limited to anaerobic sludge, mine slurry or tailings, silt, or mud; or (ii) form floating debris, scum, or other surface materials sufficient to harm existing beneficial uses; or (iii) produce color, odor, or other conditions in such a degree as to create a nuisance or harm existing beneficial uses or impart any undesirable taste to significant edible aquatic species or to the water; or (iv) are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life; or (v) produce a predominance of undesirable aquatic life; or (vi) cause a film on the surface or produce a deposit on shorelines; and

for surface waters in wetlands;

(i) produce color, odor, changes in pH, or other conditions in such a degree as to create a nuisance or harm water quality dependent functions or impart any undesirable taste to significant edible aquatic species of the wetland; or (ii) are toxic to humans, animals, plants, or aquatic life of the wetland.

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for any parameter of concern could be put in Colorado Discharge Permit System (CDPS) discharge permits.

Standards for Organic Parameters and Radionuclides

Radionuclides: Statewide Basic Standards have been developed in Section 31.11(2) and (3) of The Basic Standards and Methodologies for Surface Water to protect the waters of the state from radionuclides and organic chemicals.

In no case shall radioactive materials in surface waters be increased by any cause attributable to municipal, industrial, or agricultural practices or discharges to as to exceed the following levels, unless alternative site-specific standards have been adopted. Standards for radionuclides are shown in Table A-2.

Table A-2
Radionuclide Standards

Parameter	Picocuries per Liter
Americium 241*	0.15
Cesium 134	80
Plutonium 239, and 240*	0.15
Radium 226 and 228*	5
Strontium 90*	8
Thorium 230 and 232*	60
Tritium	20,000

*Radionuclide samples for these materials should be analyzed using unfiltered (total) samples. These Human Health based standards are 30-day average values for both plutonium and americium.

Organics: The organic pollutant standards contained in the Basic Standards for Organic Chemicals Table are applicable to all surface waters of the state for the corresponding use classifications, unless alternative site-specific standards have been adopted. These standards have been adopted as "interim standards" and will remain in effect until alternative permanent standards are adopted by the Commission. These interim standards shall not be considered final or permanent standards subject to antibacksliding or downgrading restrictions. Although not reproduced in this WQA, the specific standards for organic chemicals can be found in Regulation 31.11(3).

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for radionuclides, organics, or any other parameter of concern could be put in CDPS discharge permits.

The aquatic life standards for organics apply to all stream segments that are classified for aquatic life. The water supply standards apply only to those segments that are classified for water supply. The water + fish standards apply to those segments that have a Class 1 aquatic life and a water supply classification. The fish ingestion standards apply to Class 1 aquatic life segments that do not have a water supply designation. The water + fish and the fish ingestion standards may also apply to Class 2 aquatic life segments, where the Water Quality Control Commission has made such determination.

Because the Lightner Creek is classified for Aquatic Life Cold 1, with a water supply designation, the water + fish and aquatic life standards apply to this discharge.

Salinity and Nutrients

Salinity: Regulation 61.8(2)(l) contains requirements regarding salinity for any discharges to the Colorado River Watershed. For industrial dischargers and for the discharge of intercepted groundwater, this is a no-salt discharge requirement. However, the regulation states that this requirement may be waived where the salt load reaching the mainstem of the Colorado River is less than 1 ton per day, or less than 350 tons per year. The Division may permit the discharge of salt upon a satisfactory demonstration that it is not practicable to prevent the discharge of all salt. See Regulation 61.8(2)(l)(i)(A)(1) for industrial discharges and 61.8(2)(l)(iii) for discharges of intercepted groundwater for more information regarding this demonstration.

For municipal dischargers, an incremental increase of 400 mg/l above the flow weighted averaged salinity of the intake water supply is allowed. This may be waived where the salt load reaching the mainstem of the Colorado River is less than 1 ton per day, or less than 366 tons per year. The Division may permit the discharge of salt in excess of the 400 mg/l incremental increase, upon a satisfactory demonstration that it is not practicable to attain this limit. See Regulation 61.8(2)(l)(vi)(A)(1) for more information regarding this demonstration.

In addition, the Division's policy, Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, may be applied to discharges where an agricultural water intake exists downstream of a discharge point. Limitations for electrical conductivity and sodium absorption ratio may be applied in accordance with this policy.

Nutrients

Total Phosphorus and Total Inorganic Nitrogen: Regulation 85, the *Nutrients Management Control Regulation* has been adopted by the Water Quality Control Commission and became effective September 30, 2012. This regulation contains requirements for phosphorus and Total Inorganic Nitrogen (TIN) concentrations for some point source dischargers. Limitations for phosphorus and TIN may be applied in accordance with this regulation. However, because these WWTFs are both less than 1.0 MGD, they are excluded from nutrient limitations based on the effluent limitation exceptions provided in Regulation 85.

Temperature

Temperature shall maintain a normal pattern of diurnal and seasonal fluctuations with no abrupt changes and shall have no increase in temperature of a magnitude, rate, and duration deemed deleterious to the resident aquatic life. This standard shall not be interpreted or applied in a manner inconsistent with section 25-8-104, C.R.S.

Segment Specific Numeric Standards

Numeric standards are developed on a basin-specific basis and are adopted for particular stream segments by the Water Quality Control Commission. The standards in Table A-3 have been assigned to stream segment COSJAF14b in accordance with the *Classifications and Numeric Standards for San Juan River and Dolores River Basins*.

The Water Quality Control Commission has recently completed a final action concerning the *Classifications and Numeric Standards for San Juan River and Dolores River Basins*. Segment 14 was divided into Segment 14a and 14b to recognize a change in temperature tier. The Lightner Creek Campground discharges to Segment 14b which has a Cold Stream Tier II temperature standard (CS-II). A molybdenum standard of 160µg/L was also added to all segments in Regulation No.34 with an Agriculture Use classification. These changes became effective on March 30, 2013.

Table A-3 In-stream Standards for Stream Segment COSJAF14b
Physical and Biological
Dissolved Oxygen (DO) = 6 mg/l, minimum (7 mg/l, minimum during spawning)
pH = 6.5 – 9.0 su
E. coli chronic = 126 colonies/100 ml
Temperature April-Oct =18.3° C MWAT and 23.9° C DM
Temperature Nov-March = 9° C MWAT and 13° C DM
Inorganic
Total Ammonia acute and chronic = TVS
Chlorine acute = 0.019 mg/l
Chlorine chronic = 0.011 mg/l
Free Cyanide acute = 0.005 mg/l
Sulfide chronic = 0.002 mg/l
Boron chronic = 0.75 mg/l
Nitrite acute = 0.05 mg/l
Nitrate acute = 10 mg/l
Chloride chronic = 250 mg/l
Sulfate chronic = For WS, the greater of ambient water quality as of January 1, 2000 or 250 mg/l
Metals
Total Recoverable Aluminum acute and chronic = TVS
Dissolved Arsenic acute = 340 µg/l
Total Recoverable Arsenic chronic = 0.02 µg/l
Dissolved Cadmium acute for trout and Dissolved Cadmium chronic = TVS
Total Recoverable Trivalent Chromium acute = 50 µg/l
Dissolved Hexavalent Chromium acute and chronic = TVS
Dissolved Copper acute and chronic = TVS
Dissolved Iron chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 300 µg/l
Total Recoverable Iron chronic = 1000 µg/l
Dissolved Lead acute and chronic = TVS
Dissolved Manganese chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 50 µg/l
Dissolved Manganese acute and chronic = TVS
Total Recoverable Molybdenum chronic = 160 µg/l
Total Mercury chronic = 0.01 µg/l
Dissolved Nickel acute and chronic = TVS
Dissolved Selenium acute and chronic = TVS
Dissolved Silver acute and Dissolved Silver chronic for trout = TVS
Dissolved Zinc acute and chronic = TVS

Table Value Standards and Hardness Calculations

As metals with standards specified as Table Value Standards (TVS) are not included as parameters of concern for this facility, the hardness value of the receiving water and the subsequent calculation of the TVS equations is inconsequential and is therefore omitted from this WQA.

Total Maximum Daily Loads and Regulation 93 – Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List

This stream segment is not listed on the Division's 303(d) list of water quality impacted streams and is not on the monitoring and evaluation list.

IV. Receiving Stream Information

Low Flow Analysis

The Colorado Regulations specify the use of low flow conditions when establishing water quality based effluent limitations, specifically the acute and chronic low flows. The acute low flow, referred to as 1E3, represents the one-day low flow recurring in a three-year interval, and is used in developing limitations based on an acute standard. The 7-day average low flow, 7E3, represents the seven-day average low flow recurring in a 3 year interval, and is used in developing limitations based on a Maximum Weekly Average Temperature standard (MWAT). The chronic low flow, 30E3, represents the 30-day average low flow recurring in a three-year interval, and is used in developing limitations based on a chronic standard.

To determine the low flows available to the Lightner Creek Campground WWTF, USGS gage station 09362000 (Lightner Creek near Durango, CO) was used. This flow gage provides a representative measurement of upstream flow because it is located downstream of the two WWTFs. Daily flows from the USGS Gage Station were obtained and the annual 1E3 and 30E3 low flows were calculated using U.S. Environmental Protection Agency (EPA) DFLOW software. The output from DFLOW provides calculated acute and chronic low flows for each month. Flow data from October 1, 1939 through September 30, 1949 were available from the gage station. No other data were available. The local water commissioner verified the results were representative of current flows.

To estimate the low flows at the Lightner Creek Campground WWTF, the ratio of the watershed area above the facilities to the watershed area above the gage station was determined. The low flow calculated at the gage station was multiplied by the ratio of watershed areas to determine the low flows available for the Lightner Creek Campground WWTF.

Based on the low flow analysis described previously, the upstream low flows available to the Lightner Creek Campground WWTF were calculated and are presented in Table A-4.

Table A-4

Low Flows for Lightner Creek at the Lightner Creek Campground WWTF

Low Flow (cfs)	*Annual*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
1E3 Acute	0.47	0.64	0.64	0.68	0.93	2.10	1.00	0.81	0.55	0.55	0.47	0.55	0.47
30E3 Chronic	0.64	0.64	0.64	0.68	0.93	2.10	1.20	1.10	0.72	0.64	0.64	0.64	0.68

During the months of April and May, the acute low flow calculated by DFLOW exceeded the chronic low flow. In accordance with Division standard procedures, the acute low flow was thus set equal to the chronic low flow for these months. Due to the fact that the data is old and that temperature is not a parameter of concern, the 7E3 was not calculated and the previously calculated 1E3 and 30E3 are shown above.

The ratio of the low flow of Lightner Creek to the Lightner Creek Campground WWTF design flow is 43:1.

Flows downstream of the Lightner Creek Campground and upstream of the Lightner Creek MHP drop to zero during low flow periods. To determine the annual 1E3 and 30E3 low flows available to the Lightner Creek MHP, the local water commissioner was consulted. According to the water commissioner, at least 0.75 cubic feet per second (cfs) is always available due to flow that surfaces just upstream of the anticipated discharge point. The ratio of the low flow of Lightner Creek to the Lightner Creek MHP WWTF design flow is 48:1.

Mixing Zones

The amount of the available assimilative capacity (dilution) that may be used by the permittee for the purposes of calculating the WQBELs may be limited in a permitting action based upon a mixing zone analysis or other factor. These other factors that may reduce the amount of assimilative capacity available in a permit are: presence of other dischargers in the vicinity; the presence of a water diversion downstream of the discharge (in the mixing zone); the need to provide a zone of passage for aquatic life; the likelihood of bioaccumulation of toxins in fish or wildlife; habitat considerations such as fish spawning or nursery areas; the presence of threatened and endangered species; potential for human exposure through drinking water or recreation; the possibility that aquatic life will be attracted to the effluent plume; the potential for adverse effects on groundwater; and the toxicity or persistence of the substance discharged.

Unless a facility has performed a mixing zone study during the course of the previous permit, and a decision has been made regarding the amount of the assimilative capacity that can be used by the facility, the Division assumes that the full assimilative capacity can be allocated. Note that the review of mixing study considerations, exemptions and perhaps performing a new mixing study (due to changes in low flow, change in facility design flow, channel geomorphology or other reason) is evaluated in every permit and permit renewal.

If a mixing zone study has been performed and a decision regarding the amount of available assimilative capacity has been made, the Division may calculate the WQBELs based on this available capacity. In addition, the amount of assimilative capacity may be reduced by threatened and endangered species (T&E) implications.

For this facility, 100% of the available assimilative capacity may be used as the facility has not had to perform a mixing zone study, and the discharge is not to a T&E stream segment, and is not expected to have an influence on any of the other factors listed above.

Ambient Water Quality

The Division evaluates ambient water quality based on a variety of statistical methods as prescribed in Section 31.8(2)(a)(i) and 31.8(2)(b)(i)(B) of the *Colorado Department of Public Health and Environment Water Quality Control Commission Regulation No. 31*, and as outlined in the Division's Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits (WQP-19). Ambient water quality is evaluated in this WQA analysis for use in determining assimilative capacities and in completing antidegradation reviews for pollutants of concern, where applicable.

To conduct an assessment of the ambient water quality upstream of the Lightner Creek WWTFs, data were gathered primarily from Riverwatch Station 44 located approximately 4.4 miles downstream from the facility. Data were available for a period of record (POR) from 1997 through 2013. The most recent five years of data from 2009 through 2013 were used from this station. Data were also available from WQCD 9419 located adjacent to Riverwatch Station 44 with a POR of 2004 to 2005, and 2009 to 2010; and WQCD 9431 located 1.8 miles upstream from the facility with a POR consisting of one data point from March 2005. Data from these sources were used to reflect upstream water quality. These data are summarized in Table A-5.

Note that although the majority of these data are based on samples collected at downstream locations, they are comparable to data representative of upstream water quality. A summary of these data is presented in Table A-5.

Table A-5

Ambient Water Quality for Lightner Creek

Parameter	*Number of Samples*	*15th Percentile*	*50th Percentile*	*85th Percentile*	*Mean*	*Maximum*	*Chronic Stream Standard*	*Notes*
Temp (°C)	8	5.5	8.4	17	10	20	NA	
DO (mg/l)	1	9.5	9.5	9.5	9.5	9.5	7	
pH (su)	53	8.2	8.3	8.4	8.3	8.5	6.5-9.0	
E. coli (#/100 ml)	6	7	15	93	15	299	126	1
Nitrate+Nitrite as N (mg/l)	21	0	0.063	0.18	0.099	0.44	NA	2
Total Inorganic Nitrogen (mg/l)	21	0.01	0.08	0.21	0.13	0.44	NA	
NH_3 as N, Tot (mg/l)	21	0	0	0.05	0.027	0.35	TVS	2
NH3 as N, Tot (mg/l) Jan	2	0	0	0	0	0	TVS	2
NH3 as N, Tot (mg/l) Feb	2	0.053	0.18	0.3	0.18	0	TVS	
NH3 as N, Tot (mg/l) Mar	2	0.009	0.03	0.051	0.03	0	TVS	
NH3 as N, Tot (mg/l) Apr	3	0	0	0.007	0.0033	0	TVS	2
NH3 as N, Tot (mg/l) May	3	0.006	0.02	0.041	0.023	0	TVS	
NH3 as N, Tot (mg/l) Jun	3	0	0	0	0	0	TVS	2
NH3 as N, Tot (mg/l) Jul	2	0	0	0	0	0	TVS	2
NH3 as N, Tot (mg/l) Aug	1	0	0	0	0	0	TVS	2
NH3 as N, Tot (mg/l) Sep	0	0	0	0	0	0	TVS	
NH3 as N, Tot (mg/l) Oct	3	0	0	0.056	0.027	0	TVS	2
NH3 as N, Tot (mg/l) Nov	0	0	0	0	0	0	TVS	
NH3 as N, Tot (mg/l) Dec	0	0	0	0	0	0	TVS	
TSS (mg/l)	15	5.4	19	124	79	0	NA	3
TDS (mg/l)	2	316	375	435	375	0	NA	3
Al, Dis (µg/l)	47	0	0	17	9.6	130	NA	2
As, Dis (µg/l)	44	0	0	0	0	0	340	2
Cd, Dis (µg/l)	51	0	0	0	0.029	0.7	0.95	2
Cu, Dis (µg/l)	51	0	0	2	0.65	3.6	22	2
Fe, Dis (µg/l)	51	0	15	35	20	115	300	2
Fe, TR (µg/l)	51	56	484	3077	2180	34169	1000	
Pb, Dis (µg/l)	51	0	0	0	0.41	4.7	7.9	2
Mn, Dis (µg/l)	51	0	6.2	10	6	54	50	2
Hg, Dis (µg/l)	1	0	0	0	0	0	NA	2
Se, Dis (µg/l)	51	0	0	0	0	0	4.6	2
Ag, Dis (µg/l)	7	0	0	0	0	0	0.47	2
Zn, Dis (µg/l)	51	0	0	4.1	1.5	14	310	2
Sulfate (mg/l)	21	35	91	171	95	217	250	
Hardness as $CaCO_3$ (mg/l)	54	184	292	362	292	704	NA	

Note 1: The calculated mean is the geometric mean. Note that for summarization purposes, the value of one was used where there was no detectable amount because the geometric mean cannot be calculated using a value equal to zero.

Note 2: When sample results were below detection levels, the value of zero was used in accordance with the Division's standard approach for summarization and averaging purposes.

V. Facility Information and Pollutants Evaluated

Facility Information

The Lightner Creek Campground WWTF is located at in the NW 1/4 of Section 15, T35N, R10W; 1567 County Road 207, Durango, CO 81301; 37 in La Plata County. The current design capacity of the facility is 0.01 MGD (0.0155 cfs). Wastewater treatment is accomplished using a mechanical wastewater treatment process. The technical analyses that follow include assessments of the assimilative capacity based on this design capacity.

An assessment of Division records indicate that there are 7 facilities discharging to the same stream segment or other stream segments immediately upstream or downstream from this facility. Several of these facilities are covered by general permits and have limitations set at the water quality standards. These facilities were not modeled in this WQA as they have a minimal impact on the ambient water quality. The nearest dischargers were:

- Lightner Creek MHP WWTF described in Section II which discharges to Lightner Creek at a point approximately four miles upstream of the confluence with the Animas River.
- Durango West Metro District WWTF (COG582024), which discharges to Coal Creek, a tributary to Lightner Creek. The facility is located approximately six miles west of the City of Durango. Coal Creek enters Lightner Creek approximately 3.5 miles upstream of the confluence with the Animas River.
- City of Durango WWTF (CO0024082), which discharges to the Animas River approximately 0.5 miles downstream of the confluence with Lightner Creek.
- South Durango Sanitation District WWTF (COG588057), which discharges to the Animas River at a point approximately four and a half miles downstream from the City of Durango WWTF.

Note that due to the intermittent nature of stormwater discharges, and that these types of discharges do not typically occur at low flow conditions, they are not considered in this WQA.

Due to its proximity (0.8 miles downstream), the Lightner Creek MHP WWTF was modeled in conjunction with the Lightner Creek Campground WWTF when determining available assimilative capacities.

Pollutants of Concern

Pollutants of concern may be determined by one or more of the following: facility type; effluent characteristics and chemistry; effluent water quality data; receiving water quality; presence of federal effluent limitation guidelines; or other information. Parameters evaluated in this WQA may or may not appear in a permit with limitations or monitoring requirements, subject to other determinations such as a reasonable potential analysis, mixing zone analyses, 303(d) listings, threatened and endangered species listings or other requirement as discussed in a permit rationale.

There are no site-specific in-stream water quality standards for BOD_5 or $CBOD_5$, TSS, percent removal, and oil and grease for this receiving stream. Thus, assimilative capacities were not determined for these parameters. The applicable limitations for these pollutants can be found in

Regulation No. 62 and will be applied in the permit for the WWTF.

The following parameters were identified by the Division as pollutants to be evaluated for this facility:

- Total Residual Chlorine
- *E. coli*
- Nitrate
- Ammonia
- Temperature
- Salinity

Based upon the size of the discharge, the lack of industrial contributors, dilution provided by the receiving stream and the fact that no unusually high metals concentrations are expected to be found in the wastewater effluent, metals are not evaluated further in this water quality assessment.

Stream segment COSJAF14b is designated a water supply. The Tall Pines Village community system (PWSID no.134810) withdraws groundwater under the influence of Lightner Creek water from an alluvial well immediately downstream from the discharge locations. Thus, the nitrate standard is further evaluated as part of this WQA.

During assessment of the facility, nearby facilities, and receiving stream water quality, no additional parameters were identified as pollutants of concern.

VI. Determination of Water Quality Based Effluent Limitations (WQBELs)

Technical Information

Note that the WQBELs developed in the following paragraphs, are calculations of what an effluent limitation may be in a permit. The WQBELs for any given parameter, will be compared to other potential limitations (federal effluent limitations guidelines, state effluent limitations, or other applicable limitation) and typically the more stringent limit is incorporated into a permit. If the WQBEL is the more stringent limitation, incorporation into a permit is dependent upon a reasonable potential analysis.

In-stream background data and low flows evaluated in Sections III and IV are used to determine the assimilative capacity of Lightner Creek near the Lightner Creek Campground WWTF for pollutants of concern, and to calculate the WQBELs. For all parameters except ammonia, it is the Division's approach to calculate the WQBELs using the lowest of the monthly low flows (referred to as the annual low flow) as determined in the low flow analysis. For ammonia, it is the standard procedure of the Division to determine monthly WQBELs using the monthly low flows, as the regulations allow the use of seasonal flows.

The Division's standard analysis consists of steady-state, mass-balance calculations for most pollutants and modeling for pollutants such as ammonia. The mass-balance equation is used by the Division to calculate the WQBELs, and accounts for the upstream concentration of a pollutant at the

existing quality, critical low flow (minimal dilution), effluent flow and the water quality standard. The mass-balance equation is expressed as:

$$M_2 = \frac{M_3 Q_3 - M_1 Q_1}{Q_2}$$

Where,

Q_1 = Upstream low flow (1E3 or 30E3)
Q_2 = Average daily effluent flow (design capacity)
Q_3 = Downstream flow ($Q_1 + Q_2$)
M_1 = In-stream background pollutant concentrations at the existing quality
M_2 = Calculated WQBEL
M_3 = Water Quality Standard, or other maximum allowable pollutant concentration

The upstream background pollutant concentrations used in the mass-balance equation will vary based on the regulatory definition of existing ambient water quality. For most pollutants, existing quality is determined to be the 85th percentile. For metals in the total or total recoverable form, existing quality is determined to be the 50th percentile. For pathogens such as fecal coliform and *E. coli*, existing quality is determined to be the geometric mean.

For temperature, the highest 7-day mean (for the chronic standard) of daily average stream temperature, over a seven consecutive day period will be used in calculations of the chronic temperature assimilative capacity, where the daily average temperature should be calculated from a minimum of three measurements spaced equally through the day. The highest 2-hour mean (for the acute standard) of stream temperature will be used in calculations of the acute temperature assimilative capacity. The highest 2-hour mean should be calculated from a minimum of 12 measurements spaced equally through the day.

Because the two facilities are in close proximity, they must be modeled together for shared parameters of concern. When facilities are modeled together, the design flow, Q_2, reflects the combined design flow of the facilities modeled together for a particular parameter, thereby resulting in the calculation of the WQBELs, M_2, applicable to the modeled facilities as set forth below. The Lightner Creek Campground and the Lightner Creek MHP were modeled together for ammonia, TRC, *E. coli* and Nitrate.

Calculation of WQBELs

Using the mass-balance equation provided in the beginning of Section VI, the acute and chronic low flows set out in Section IV, ambient water quality as discussed in Section IV, and the in-stream standards shown in Section III, the WQBELs for were calculated. The data used and the resulting WQBELs, M_2, are set forth in Table A-6a for the chronic WQBELs and A-6b for the acute WQBELs.

Where a WQBEL is calculated to be a negative number and interpreted to be zero, the Division standard procedure is to allocate the water quality standard to prevent further degradation of the receiving waters.

Chlorine: There are no point sources discharging total residual chlorine upstream of the Lightner Creek Campground WWTF. Because chlorine is rapidly oxidized, in-stream levels of residual chlorine are detected only for a short distance below a source. Ambient chlorine was therefore assumed to be zero.

***E. coli*:** For *E. coli*, the Division establishes the 7-day geometric mean limit as two times the 30-day geometric mean limit and also includes maximum limits of 2,000 colonies per 100 ml (30-day geometric mean) and 4,000 colonies per 100 ml (7-day geometric mean).

Temperature: The 7E3 low flow is in this case based on the 30E3 flow of 0.64 cfs, resulting in a dilution ratio (7E3 low flow to effluent) of 43:1. As the discharge is from a Domestic WWTF where the available dilution ratio is > 10:1, in accordance with the Division's Temperature Policy, no temperature limitations are required.

Nitrate / Total Inorganic Nitrogen (T.I.N.): An acute nitrate standard of 10 mg/l is assigned to this segment, and is intended to be applied at the nearest downstream water intake, which is located immediately downstream from the Lightner Creek MHP WWTF. Because nitrite and ammonia can also form nitrate, compliance with the nitrate standard is achieved through imposition of a Total Inorganic Nitrogen (T.I.N.) limit of 10 mg/l. T.I.N. effectively measures nitrate and its precursors including nitrite and ammonia.

To determine the background concentration for Total Inorganic Nitrogen for use in the mass balance equation, same day samples of the ambient data for ammonia, nitrite and nitrate (or nitrite + nitrate) were added together to calculate the T.I.N. The 85th percentile of this summed data was calculated as 0.21 mg/l and used as the ambient water quality for T.I.N.

Table A-6a

Chronic WQBELs

Parameter	***Q_1 (cfs)***	***Q_2 (cfs)***	***Q_3 (cfs)***	***M_1***	***M_3***	***M_2***	***Notes***
E. coli (#/100 ml)	0.64	0.031	0.679	15	126	***2,418***	
TRC (mg/l)	0.64	0.031	0.679	0	0.011	***0.24***	

Note the Q_2 design flow is the combined flow from the two facilities.

Table A-6b

Acute WQBELs

Parameter	Q_1 *(cfs)*	Q_2 *(cfs)*	Q_3 *(cfs)*	M_1	M_3	M_2	*Notes*
E. coli (#/100 ml)	2 X Chronic WQBEL					***4,836***	1
TRC (mg/l)	0.47	0.031	0.509	0	0.019	***0.31***	
Nitrate as N (mg/l)	0.47	0.031	0.509	0	10	***162***	2
Nitrite as N (mg/l)	0.47	0.031	0.509	0	0.05	***0.81***	2
Nitrate+Nitrite as N (mg/l)	0.47	0.031	0.509	0.18	NA	***NA***	2
Total Inorganic Nitrogen (mg/l)	0.47	0.031	0.509	0.21	10	***161***	2

Note the Q_2 design flow is the combined flow from the two facilities.

Note 1: The acute *E.coli* limit is calculated at 2 times the chronic limit.

Note 2: Compliance with the nitrate standard is achieved through imposition of a T.I.N. limit of 10 mg/l. The other N parameters are provided for informational purposes.

Ammonia: The Ammonia Toxicity Model (AMMTOX) is a software program designed to project the downstream effects of ammonia and the ammonia assimilative capacities available to each discharger based on upstream water quality and effluent discharges. To develop data for the AMMTOX model, an in-stream water quality study should be conducted of the upstream receiving water conditions, particularly the pH and corresponding temperature, over a period of at least one year.

Temperature, corresponding pH and ammonia data sets reflecting upstream ambient receiving water conditions were available for Lightner Creek as presented in Section III, Table A-5. Data was interpolated for months without data.

Representative downstream pH and Temperature data were not available to establish conditions; therefore, default values were used in the AMMTOX model. Effluent pH data were available from DMR records and interpolation was conducted for months lacking data. Effluent Temperature data was not available; therefore, data used in the most recent Lightner Creek ammonia analysis from 2012 was used.

The AMMTOX model may be calibrated for a number of variables in addition to the data discussed above. The values used for the other variables in the model are listed below:

- Stream velocity = $0.3Q^{0.4d}$
- Default ammonia loss rate = 6/day
- pH amplitude was assumed to be medium
- Default times for pH maximum, temperature maximum, and time of day of occurrence
- pH rebound was set at the default value of 0.2 su per mile
- Temperature rebound was set at the default value of 0.7 degrees C per mile.

The results of the ammonia analyses for the Lightner Creek Campground and MHP WWTFs are presented in Table A-7.

Table A-7

AMMTOX Results for Lightner Creek at the Lightner Creek Campground and MHP WWTFs

Design of 0.01 MGD (0.0155 cfs) for each facility

Month	*Total Ammonia Chronic (mg/l)*	*Total Ammonia Acute (mg/l)*
January	39	79
February	37	79
March	34	69
April	45	90
May	99	199
June	52	103
July	45	91
August	32	79
September	32	73
October	38	64
November	33	62
December	44	71

VII. Antidegradation Evaluation

As set out in *The Basic Standards and Methodologies for Surface Water*, Section 31.8(2)(b), an antidegradation analysis is required except in cases where the receiving water is designated as "Use Protected." Note that "Use Protected" waters are waters "that the Commission has determined do not warrant the special protection provided by the outstanding waters designation or the antidegradation review process" as set out in Section 31.8(2)(b). The antidegradation section of the regulation became effective in December 2000, and therefore antidegradation considerations are applicable to this WQA analysis.

According to the *Classifications and Numeric Standards for San Juan River and Dolores River Basins*, stream segment COSJAF14b is Undesignated. Thus, an antidegradation review is required for this segment if new or increased impacts are found to occur.

Introduction to the Antidegradation Process

The antidegradation process conducted as part of this water quality assessment is designed to determine if an antidegradation review is necessary and if necessary, to complete the required calculations to determine the limits that can be selected as the antidegradation-based effluent limit (ADBEL), absent further analyses that must be conducted by the facility.

As outlined in the *Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance* (AD Guidance), the first consideration of an antidegradation evaluation is to determine if new or increased impacts are expected to occur. This is determined by a comparison of the newly calculated WQBELs verses the existing permit limitations in place as of

September 30, 2000, and is described in more detail in the analysis. Note that the Antidegradation (AD) Guidance refers to the permit limitations as of September 30, 2000 as the existing limits.

If a new or increased impact is found to occur, then the next step of the antidegradation process is to go through the significance determination tests. These tests include: 1) bioaccumulative toxic pollutant test; 2) temporary impacts test; 3) dilution test (100:1 dilution at low flow) and; 4) a concentration test.

As the determination of new or increased impacts, and the bioaccumulative and concentration significance determination tests require more extensive calculations, the Division will begin the antidegradation evaluation with the dilution and temporary impact significance determination tests. These two significance tests may exempt a facility from further AD review without the additional calculations.

Note that the antidegradation requirements outlined in *The Basic Standards and Methodologies for Surface Water* specify that chronic numeric standards should be used in the antidegradation review; however, where there is only an acute standard, the acute standard should be used. The appropriate standards are used in the following antidegradation analysis.

Significance Tests for Temporary Impacts and Dilution

This is not a temporary discharge and therefore exclusion based on a temporary discharge cannot be granted and the AD evaluation must continue.

The ratio of the chronic (30E3) low flow to the design flow is 43:1, and is less than the 100:1 significance criteria. Therefore this facility is not exempt from an AD evaluation based on the dilution significance determination test, and the AD evaluation must continue.

For the determination of a new or increased impact and for the remaining significance determination tests, additional calculations are necessary. Therefore, at this point in the antidegradation evaluation, the Division will go back to the new or increased impacts test. If there is a new or increased impact, the last two significance tests will be evaluated.

New or Increased Impact and Non Impact Limitations (NILs)

To determine if there is a new or increased impact to the receiving water, a comparison of the new WQBEL concentrations and loadings verses the concentrations and loadings as of September 30, 2000, needs to occur. If either the new concentration or loading is greater than the September 2000 concentration or loading, then a new or increased impact is determined. If this is a new facility (commencement of discharge after September 30, 2000) it is automatically considered a new or increased impact.

Note that the AD Guidance document includes a step in the New or Increased Impact Test that calculates the Non-Impact Limit (NIL). The permittee may choose to retain a NIL if certain conditions are met, and therefore the AD evaluation for that parameter would be complete. As the NIL is typically greater than the Antidegradation-based average concentration (ADBAC), and is therefore the chosen limit, the Division will typically conclude the AD evaluation after determining

the NIL. Where the NILs are very stringent, or upon request of a permittee, the Division will calculate both the NIL and the AD limitation so that the limitations can be compared and the permittee can determine which of the two limits they would prefer, one which does not allow any increased impact (NIL), or the other which allows an insignificant impact (AD limit).

The NIL is defined as the limit which results in no increased water quality impact (no increase in load or limit over the September 2000 load or limit). The NIL is calculated as the September 2000 loading, divided by the new design flow, and divided by a conversion factor of 8.34. **If there is no change in design flow, then the NIL is equal to the September 2000 permit limitation.**

If the facility was in place, but did not have a limitation for a particular parameter in the September 2000 permit, the Division may substitute an implicit limitation. Consistent with the First Update to the AD Guidance of April 2002, an implicit limit is determined based on the approach that specifies that the implicit limit is the maximum concentration of the effluent from October 1998 to September 2000, if such data is available. If this data is unavailable, the Division may substitute more recent representative data, if appropriate, on a case by case basis. Note that if there is a change in design flow, the implicit limit/loading is subject to recalculation based on the new design flow. For parameters that are undisclosed by the permittee, and unknown to the Division to be present, an implicit limitation may not be recognized.

This facility was in place as a discharger prior to September 30, 2000, and therefore the new or increased impacts test must be conducted. **As the design flow for this facility is the same as it was in September 2000, the NILs are equal to the permit limitations as of September 2000.**

For total residual chlorine and total ammonia, the limitations as of September 2000 were used in the evaluation of new or increased impacts.

For *E. coli*, data from this timeframe were used to determine an implicit limitation. In accordance with the Division's practice regarding *E. coli*, an implicit limit for *E. coli* is determined as 0.32 times the permit limit for fecal coliform.

For T.I.N., there are no effluent data available and therefore, the Division will include monitoring requirements in the permit so that data can be collected in order to make such a determination of an implicit limit.

Calculation of Loadings for New or Increased Impact Test

The equations for the loading calculations are given below. Note that the AD requirements outlined in *The Basic Standards and Methodologies for Surface Water* specify that chronic numeric standards should be used in the AD review; however, where there is only an acute standard, the acute standard should be used. Thus, the chronic low flows will be used later in this AD evaluation for all parameters with a chronic standard, and the acute low flows will be used for those parameters with only an acute standard.

$$\textit{Previous permit load} = M_{permitted}\,(mg/l) \times Q_{permitted}\,(mgd) \times 8.34$$
$$\textit{New WQBELs load} = M_2\,(mg/l) \times Q_2\,(mgd) \times 8.34$$

Where,

$M_{permitted}$ = September 2000 permit limit (or implicit limit) **(mg/l)**
$Q_{permitted}$ = design flow as of September 2000 **(mgd)**
Q_2 = current design flow (same as used in the WQBEL calculations)
M_2 = new WQBEL concentration **(mg/l)**
8.34 = unit conversion factor

Table A-8 shows the results of these calculations and the determination of a new or increased impact.

Table A-8

Determination of New or Increased Impacts

Pollutant	***Existing Sept 2000 Permit Limit***	***Sept 2000 Permit Load (lbs/day)***	***New WQBEL***	***New WQBEL Load (lbs/day)***	***New or Increased Impact***
E. coli (#/100 ml)	1696*	141	2418	202	Yes
TRC (mg/l)	0.14	0.012	0.24	0.02	Yes
T.I.N. (mg/l)	none	NA	161	13.4	NA
NH_3, Tot (mg/l) Jan	5	0.42	39	3.3	Yes
NH_3, Tot (mg/l) Feb	5	0.42	37	3.1	Yes
NH_3, Tot (mg/l) Mar	5	0.42	34	2.8	Yes
NH_3, Tot (mg/l) Apr	5	0.42	45	3.8	Yes
NH_3, Tot (mg/l) May	5	0.42	99	8.3	Yes
NH_3, Tot (mg/l) Jun	5	0.42	52	4.3	Yes
NH_3, Tot (mg/l) Jul	5	0.42	45	3.8	Yes
NH_3, Tot (mg/l) Aug	5	0.42	32	2.7	Yes
NH_3, Tot (mg/l) Sep	5	0.42	32	2.7	Yes
NH_3, Tot (mg/l) Oct	5	0.42	38	3.2	Yes
NH_3, Tot (mg/l) Nov	5	0.42	33	2.8	Yes
NH_3, Tot (mg/l) Dec	5	0.42	44	3.7	Yes

Note that loading for E. coli cannot be calculated; but, for comparison purposes, the approach is sufficient.
*The September 2000 Limit for *E.coli* is an implicit limit based on 0.32 times the fecal coliform limit of 5300 #/100ml.
The Loads are determined using only the Design Flow for the Lightner Creek Campground WWTF and not the combined flows from the two facilities.

As shown in Table A-8, for all parameters except T.I.N. there are new or increased impacts and in accordance with regulation, the permittee has the option of choosing either the Existing Limits as of September 30, 2000 or ADBAC's. Because the ADBAC's are generally more stringent than Existing Limits, the Division assumes that the permittee will choose Existing Limits rather than ADBAC's, and therefore the Division will stop the AD evaluation at this point and assign the Existing Limits to the permit.

Antidegradation analyses included in water quality assessments completed in 2002 and 2009 did not present the option of acceptance of the Existing Limit and proceeded directly to the calculation of ADBACs. The 2002 ammonia ADBACs were based on data from a different watershed. The ADBACs were updated in 2009 due to the availability of Lightner Creek data. The 2009 ADBACs resulted in summer total ammonia values of 6.0 to 6.9 mg/l. The 2009 analyses utilized a baseline water quality value calculated as the mean of the Lightner Creek total ammonia data (0.14 mg/l). The baseline should have calculated using the 85th percentile of the data resulting in a baseline water quality value closer to 0.24 mg/l. The resulting ADBACs calculated in 2009 for total ammonia utilizing the 85th % concentration of 0.24 mg/l would have been much more stringent than the 6.0 to 6.9 mg/l and more stringent than the Existing Limit of 5 mg/l. Since the ADBACs would be more stringent than the Existing Limit of 5 mg/l, the Division will assign the Existing Limit for total ammonia in the permit.

For T.I.N. where there is not an Existing Limit (either implicit or explicit) the AD Guidance allows for the collection of data to determine an implicit limitation. Therefore, the permittee will be required to conduct "monitoring only" for those parameters. The permittee may request ADBAC limits. If the permittee does request ADBAC limits, the Division will proceed with the completion of this Antidegradation Analysis.

The end results of this AD evaluation are in Table A-9 with the final potential limitation identified (Existing Limit or WQBEL).

Table A-9

Final Selection of WQBELs or Existing Limits

Pollutant	***Existing September 2000 Limit***	***New WQBEL***	***Chosen Limit***
E. coli (#/100 ml)	1696	2418	Existing Limit
TRC (mg/l)	0.14	0.24	Existing Limit
Total Inorganic Nitrogen (mg/l)	NA	161	WQBEL
NH3 as N, Tot (mg/l) Jan	5	39	Existing Limit
NH3 as N, Tot (mg/l) Feb	5	37	Existing Limit
NH3 as N, Tot (mg/l) Mar	5	34	Existing Limit
NH3 as N, Tot (mg/l) Apr	5	45	Existing Limit
NH3 as N, Tot (mg/l) May	5	99	Existing Limit
NH3 as N, Tot (mg/l) Jun	5	52	Existing Limit
NH3 as N, Tot (mg/l) Jul	5	45	Existing Limit
NH3 as N, Tot (mg/l) Aug	5	32	Existing Limit
NH3 as N, Tot (mg/l) Sep	5	32	Existing Limit
NH3 as N, Tot (mg/l) Oct	5	38	Existing Limit
NH3 as N, Tot (mg/l) Nov	5	33	Existing Limit
NH3 as N, Tot (mg/l) Dec	5	44	Existing Limit

For *E.coli*, TRC and ammonia, the Existing Limits have been established for this facility. The Existing Limits were selected as they are less stringent than the WQBELs; however, the facility has the final choice between the Existing Limits and ADBACs, and if the ADBAC is preferred, the permit writer should be contacted.

It should be noted, the Existing Limit for total ammonia of 5 mg/l was a permitted limit from 1991 to 2002. Division records indicate they were no violations of that limit during that time. The limit should have been retained due to antidegradation provisions in both the 2002 and 2009 permit renewals but the antidegradation process was incorrectly applied at those times. The most recent permit renewal in 2009 included a generous compliance schedule to provide time for the facility to study if it could meet 'more stringent' final (2014) ammonia limits than those issued in 2009. The Lightner Creek Campground WWTF permittee failed to deliver on any of the milestones of the compliance schedule according to Division records. Since the facility was able to historically meet the ammonia limits of 5 mg/l, there have been no process or design flow changes at the mechanical facility, and the permittee failed to respond to milestones laid out in the current compliance schedule regarding its ability to meet ammonia limits, the Division will implement the Existing Limits of 5 mg/l in this permit renewal.

Similarly, for TRC, the limit of 0.14 mg/l was in effect from 1997 through 2009. There previously had been limits since 1986 of 0.11, 0.15 or 0.08 mg/l. Division records indicate no violations of those limits at those times. The 2009 permit should not have had a delayed implementation until 2014 to meet the limit of 0.14 mg/l since the facility had been meeting those levels historically. The Division will implement the 0.14 mg/l Existing Limit in this renewal.

Alternatives Analysis

If the permittee does not want to accept an effluent limitation that results in no increased impact (Existing Limit) or in insignificant degradation (ADBAC), the applicant may conduct an alternatives analysis (AA). The AA examines alternatives that may result in no degradation or less degradation, and are economically, environmentally, and technologically reasonable. If the proposed activity is determined to be important economic or social development, a determination shall be made whether the degradation that would result from such regulated activity is necessary to accommodate that development. The result of an AA may be an alternate limitation between the ADBEL and the WQBEL, and therefore the ADBAC would not be applied. This option can be further explored with the Division. See Regulation 31.8 (3)(d), and the Antidegradation Guidance for more information regarding an alternatives analysis.

VIII. Technology Based Limitations

Federal Effluent Limitation Guidelines

The Federal Effluent Limitation Guidelines for domestic wastewater treatment facilities are the secondary treatment standards. These standards have been adopted into, and are applied out of, Regulation No. 62, the Regulations for Effluent Limitations.

Regulations for Effluent Limitations

Regulation No. 62, the Regulations for Effluent Limitations, includes effluent limitations that apply to all discharges of wastewater to State waters, with the exception of storm water and agricultural return flows. These regulations are applicable to the discharge from the proposed discharge.

Table A-10 contains a summary of the applicable limitations for pollutants of concern at this facility.

Table A-10

Regulation No. 62 Based Limitations

Parameter	***30-Day Average***	***7-Day Average***	***Instantaneous Maximum***
BOD_5	30 mg/l	45 mg/l	NA
BOD_5 Percent Removal	85%	NA	NA
TSS, mechanical plant	30 mg/l	45 mg/l	NA
TSS Percent Removal	85%	NA	NA
Total Residual Chlorine	NA	NA	0.5 mg/l
pH	NA	NA	6.0-9.0 s.u.
Oil and Grease	NA	NA	10 mg/l

IX. References

Regulations:

The Basic Standards and Methodologies for Surface Water, Regulation No. 31, Colorado Department Public Health and Environment (CDPHE), Water Quality Control Commission, effective January 31, 2013.

Classifications and Numeric Standards for San Juan River and Dolores River Basins, Regulation No. 34, Colorado Department Public Health and Environment, Water Quality Control Commission, effective May 13, 2013

Colorado River Salinity Standards, Regulation No. 39, CDPHE, WQCC *(last update effective 8/30/97)*

Regulations for Effluent Limitations, Regulation No. 62, CDPHE, WQCC, July 30, 2012.

Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List, Regulation No. 93, Colorado Department Public Health and Environment, Water Quality Control Commission, effective March 30, 2012.

Policy and Guidance Documents:

Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance, Colorado Department Public Health and Environment, Water Quality Control Division, December 2001.

Memorandum Re: First Update to (Antidegradation) Guidance Version 1.0, Colorado Department Public Health and Environment, Water Quality Control Division, April 23, 2002.

Rationale for Classifications, Standards and Designations of Segments of the San Juan River, Colorado Department Public Health and Environment, Water Quality Control Division, effective November 26, 2012.

Policy Concerning Escherichia coli versus Fecal Coliform, CDPHE, WQCD, July 20, 2005.

Colorado Mixing Zone Implementation Guidance, Colorado Department Public Health and Environment, Water Quality Control Division, effective April 2002.

Policy for Conducting Assessments for Implementation of Temperature Standards in Discharge Permits, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-23, effective July 3, 2008.

Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-24, effective March 10, 2008.

Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-19, effective May 2002.